

EXHIBIT E

071621final

1

1 UNITED STATES DISTRICT COURT
2 DISTRICT OF MASSACHUSETTS
2 CASE NO.: 1:19-CV-12551-FDS

3 SINGULAR COMPUTING LLC,

4 Plaintiff,

5 v.

6 GOOGLE LLC,

7 Defendant.

8 _____/

9

10

11 (HIGHLY CONFIDENTIAL - ATTORNEYS' EYES ONLY)

12 REMOTE VIDEOTAPED DEPOSITION OF

13 NORMAN JOUPPI

14

15 FRIDAY, JULY 16, 2021
16 9:15 a.m. - 3:00 p.m. PST

17

18

19

20

21

22

071621final

17 You can answer, if you can.

18 THE WITNESS: [REDACTED]

19 [REDACTED] [REDACTED]

20 [REDACTED]

21 BY MR. SEEVE:

22 Q That's fair. Let me rephrase that question.

23 This document might not be an accurate

24 reflection of the operation or design of [REDACTED]

25 [REDACTED] as it exists in Google data centers; is that

HIGHLY CONFIDENTIAL
ATTORNEYS' EYES ONLY

80

1 correct?

2 A That is correct.

3 Q Do you know whether this document is accurate

4 or not?

5 A No.

6 MR. BHANSALI: Objection.

7 BY MR. SEEVE:

8 Q Would you be able upon examining this document
9 to tell me whether it's accurate or not?

10 MR. BHANSALI: Objection. Vague.

11 THE WITNESS: I'd have to look at the code.

071621final

12 The Verilog.

13 BY MR. SEEVE:

14 Q Without looking at the Verilog code, you would
15 be unable to look at a diagram within this document and
16 tell me whether it accurately reflects the operation of
17 [REDACTED]; is that correct?

18 MR. BHANSALI: Objection. Vague.

19 THE WITNESS: That's correct.

20 BY MR. SEEVE:

21 Q Earlier you testified that you were in charge
22 of the architecture of the TPU; isn't that right?

23 A Right.

24 Q And you testified that --

25 A Typically, like the instruction set, you know,

HIGHLY CONFIDENTIAL
ATTORNEYS' EYES ONLY

81

1 and what operations are performed, not necessarily how
2 they're implemented.

3 Q And you testified earlier that the
4 architecture is above the implementation, correct?

5 A Right. In the past there was a distinction
6 made that between architecture and organization, but

071621final

7 that distinction is less common today.

8 Q And, for example, the number of rounding

9 circuits that are contained within the VPU of a

10 [REDACTED] or [REDACTED] you testified earlier, is an

11 implementation detail of which you are not aware; is

12 that correct?

13 MR. BHANSALI: Objection. Mischaracterizes

14 testimony.

15 THE WITNESS: Correct.

16 BY MR. SEEVE:

17 Q You said earlier that you would have to look

18 at the Verilog to verify whether this document,

19 Exhibit 5, is accurate. Do you recall?

20 A Yes.

21 Q The Verilog represents the implementation of

22 the TPU, correct?

23 A Yes.

24 Q The Verilog is code that is processed and

25 ultimately turned into a physical chip that is included

HIGHLY CONFIDENTIAL
ATTORNEYS' EYES ONLY

82

1 within a TPU device, correct?

071621final

2 MR. BHANSALI: Objection.

3 THE WITNESS: That's correct.

4 BY MR. SEEVE:

5 Q The implementation of the TPU device follows
6 the architecture that you designed, doesn't it?

7 A No. Only in terms of architectural visible
8 operation.

9 Q Can you explain what you mean by architectural
10 visible operation?

11 A Well, if you have an add instruction and it's
12 an integer add, it should conform to the rules of
13 integer arithmetic and that's how it's specified at the
14 architecture the whole, but you could implement the
15 adder with a multitude of methods such as ripple-carry,
16 carry-lookahead, carry-select, carry-skip, et cetera, et
17 cetera.

18 Q So I'd like to direct to you Page 236146,
19 which is Page 3 of Exhibit 5. Can you let me know when
20 you have that page in front of you?

21 A Yeah, I have Page 5. That's the one ending in
22 148 for the Bates Number?

23 Q No, I'm actually looking at the Page 236146,
24 which is Page 3 of the exhibit.

25 A Oh, okay.